LCA LOUISIANA CHEMICAL ASSOCIATION

DAN S. BORNÉ
PRESIDENT

April 22, 2005

U.S. Environmental Protection Agency — ***Via Email***
Office of Water/Office of Science and Technology
Health and Ecological Criteria Division MC-4304T
Response to Region 4 White Paper
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: Comments of the Louisiana Chemical Association
Regarding Region 4 White Paper
"Evaluation of the Role of Nitrogen and Phosphorus in Causing or Contributing to Hypoxia in the Northern Gulf"

Dear Sir/Madam:

The Louisiana Chemical Association ("LCA") appreciates the opportunity to comment on the above-referenced White Paper (the "White Paper"). LCA is a non-profit Louisiana corporation, composed of sixty-eight (68) members located at over ninety (90) plant sites in Louisiana. Each such plant site has wastewater discharges subject to the NPDES program, either directly or as delegated to the State of Louisiana. Further, a number of LCA members have wastewater discharges to the Mississippi River which contain nutrients (either nitrogen or phosphorus compounds).

LCA requests that these comments be placed in the official record in connection with consideration of the White Paper. LCA further requests that EPA acknowledge receipt of LCA's comments by return email to the sender at: dwayne.johnson@keanmiller.com. LCA's comments on the White Paper follow.

LCA COMMENTS ON WHITE PAPER

1. General--Incorporation of Other Comments.

LCA hereby adopts and incorporates by reference those comments on the White Paper made by members of LCA, the American Chemistry Council, The Fertilizer Institute, and the Louisiana Department of Environmental Quality ("LDEQ") to the extent such comments are not inconsistent with the comments made herein by LCA.

926483-1

2. LaELP Report.

LCA submits that the attached report, entitled "Nutrient Releases to the Mississippi River in the Louisiana Industrial Corridor," prepared by Alfred T. Knecht, Ph.D., for the Louisiana Environmental Leadership Pollution Prevention Program (the "LaELP Report") should be included in the record for the White Paper. The LaELP Report was prepared to document reductions in both nitrogen and phosphorus discharges to the Mississippi River by Louisiana industry and was previously distributed to the National Hypoxia Task Force and interested individuals, as well as the Environmental Protection Agency ("EPA").

The LaELP Report documents Louisiana dischargers' significant reductions in the discharge of phosphorus compounds to the Mississippi River. Perhaps more importantly, the LaELP Report establishes that nutrient discharges from Louisiana industrial and municipal point sources essentially have no impact on the concentrations of nutrients in the Mississippi River, **as there is no significant difference between the nutrient concentrations--including phosphorus--in Mississippi River water as it enters Louisiana at the state's boundaries and the nutrient concentrations in Mississippi River water at the river's mouth below New Orleans**. The LaELP Report thus essentially refutes any assertions made in the White Paper that phosphorus discharges in the lower Mississippi River are a major cause of hypoxia. LCA submits that the White Paper's conclusions in this regard, at least, must have been based on inadequate, or erroneous, information regarding discharges of phosphorus compounds by Louisiana dischargers.[1]

3. Need for Peer Review.

LCA submits that, at a minimum, the White Paper should not be accepted by EPA, other governmental agencies, or the general public without adequate scientific peer review. Absent appropriate scientific peer review, the White Paper should not be the basis for any government inspired or required action, such as voluntary or mandatory reductions in nutrient loadings to the lower Mississippi River.

---

[1] The LaELP Report details a number of the recent significant reductions in point source discharges of nutrients to the Mississippi River. For example, the LaELP Report establishes that the fertilizer industry in Louisiana has reduced phosphoric acid releases in twelve Louisiana parishes along the lower Mississippi River by 80% during the period from 1987 to 1998.

4. <u>Support for Current Hypoxia Task Force Efforts</u>.

LCA does not believe Louisiana point source discharges of nutrients --municipal or industrial, nitrogen or phosphorus--play a significant role in the formation of hypoxia in the Gulf of Mexico. LCA does, however, support the efforts of the national Hypoxia Task Force and believes that its efforts in fostering voluntary reductions in both nitrogen and phosphorus throughout the Mississippi River watershed should continue.

Unlike the White Paper, in its present form, the national Hypoxia Task Force's efforts are based on numerous, scientifically peer-reviewed, studies. LCA submits that these studies and the continuing efforts of the national Hypoxia Task Force should be the focus of the government's efforts to reduce nutrient loadings to the Mississippi River and thereby address the hypoxia issue in the Gulf of Mexico. The White Paper should not detract from, or otherwise interfere with, the efforts of the national Hypoxia Task Force in achieving voluntary reductions of nutrients within the Mississippi River watershed.

- -

LCA welcomes further review and dialogue with EPA personnel in light of the significant impact that governmental action based on the White Paper may have on industry. Should you have any questions regarding the written comments of LCA, please do not hesitate to contact me at (225) 344.2609.

Thank you for all of your assistance and cooperation.

Very truly yours,

LOUISIANA CHEMICAL ASSOCIATION

Henry T. Graham Jr.

Henry T. Graham, Jr.
Director of Legal and Environmental Affairs

HTGJr/rvg
Enclosures

926483-1

NUTRIENT RELEASES TO THE MISSISSIPPI RIVER IN THE LOUISIANA INDUSTRIAL CORRIDOR

Voluntary Reductions in Nitrogenous and Phosphatic Compounds

Prepared by:

Albert T. Knecht, Ph.D
Adjunct Associated Professor
Department of Civil and Environmental Engineering
College of Engineering
and the
Urban Waste Management and Research Center
University of New Orleans
New Orleans, La. 70148

for

The Louisiana Environmental Leadership Pollution Prevention Program
Louisiana Department of Environmental Quality

Interagency Agreement No. 541321

Revised August 18, 2000

TABLE OF CONTENTS

TABLES

FIGURES

FIGURES (Cont'd)

ACKNOWLEDGEMENTS

This report was prepared for the Louisiana Environmental Leadership Pollution Prevention Program (LaELP) and funded by the Louisiana Department of Environmental Quality (LADEQ) through an agreement with the University of New Orleans Urban Waste Management and Research Foundation. An Hypoxia Task Force was formed by LaELP to assist in the preparation of the report.

Hypoxia Task Force Members

Tom Carville, CF Industries
Victor R. Cross, Novartis
Walter Eldredge, EXXON-Mobil
Hugh C. Finklea, LADEQ/LaELP
Henry Graham, Louisiana Chemical Association
Jim Harris, Harris Deville
Gary Johnson, LADEQ
George Kady, BASF
Albert T. Knecht, University of New Orleans
Richard Metcalf, LMOGA
Russell G. Olivier, IMC-Agrico
Mike Patterson, PCS Nitrogen
Dugan Sabins, LADEQ
John Schneller, CYTEC

The author would like to acknowledge the cooperation and assistance provided by Task Force members in collecting data, assisting in data interpretation and presentation, and editing drafts of the report. The author would especially like to express his appreciation to Linda Brown of LDEQ and her staff for providing the detailed TRI data and information on changes in TRI reporting; and to Gary Aydell of LDEQ for background information on the refining industry. Special thanks go to Dugan Sabins and Gary Johnson of LDEQ for their technical assistance and efforts in coordinating the project with the various industry groups and the LDEQ staff.

Special thanks also go to my associates at the University of New Orleans, Urban Waste Management and Research Center and the Department of Civil and Environmental Engineering for their technical and editorial comments.

Kenneth McManis, Ph.D. Director and Department Chairman
Bhaskar Kura, Ph.D.
Enrique La Motta, Ph.D.
Alex McCorquodale, Ph.D.

NUTRIENT RELEASES TO THE MISSISSIPPI RIVER IN THE LOUISIANA INDUSTRIAL CORRIDOR

Voluntary Reductions in Nitrogenous and Phosphatic Compounds

August 18, 2000

I. Introduction

This report was prepared for the Louisiana Environmental Leadership Pollution Prevention Program to document the voluntary reductions in nutrient releases to the Mississippi River by industry within the Industrial Corridor. Nutrients in the river water entering the Gulf of Mexico appear to contribute to "a dead zone" in the Gulf along the Louisiana Coast. The nutrient release data presented are from the Toxics Release Inventory (TRI) Reports prepared by the Louisiana Department of Environmental Quality (LDEQ). Many of the reported reductions in releases, particularly of phosphoric acid, are due to voluntary pollution prevention initiatives by industry, rather than compliance with regulations. The TRI reporting of ammonia and nitrate compound releases to surface water follows major reduction of these pollutants in the 1970s under the Clean Water Act.

The Mississippi River Industrial Corridor (MRIC) is a highly industrialized area covering 12 Louisiana parishes along the lower Mississippi river. The MRIC begins in West Feliciana Parish and continues through East and West Baton Rouge, Iberville, Ascension, St. James, St. John, St. Charles, Jefferson, Orleans, St. Bernard and Plaquemines Parishes. This region of the state contains about 48 % of the Louisiana TRI reporting facilities, and accounted for approximately 77% of the state's total releases and 97% of releases to surface water in 1997. Releases in the MRIC continue to show an overall decline of approximately 75% from the baseline year (1987). Since this region has the greatest concentration of point source nutrient releases to the river, it is therefore the primary focus of this report.

Current national and local interests in nutrient releases to the Mississippi River are related to a "dead zone" or "hypoxia zone" (low oxygen) on the Louisiana continental shelf in the Gulf of Mexico. This area of the Gulf, and associated estuaries are one of the most productive fisheries in the United States. Reports of eutrophication and hypoxia in the near coastal waters in recent years has caused concern among scientists, commercial and sports fishermen, and the general public. Increases in the spatial occurrence of summer hypoxic or dead zones along the Louisiana continental shelf have been attributed to increased loading of nutrients from the Mississippi River. Areas of low oxygen along the Louisiana shelf were documented as early as 1970.

The outflows of the Mississippi and Atchafalaya Rivers dominate the nutrient loads to the continental shelf where hypoxia is likely to develop. It is estimated that about 70% of the Mississippi River system flow passes through the industrial corridor with the remainder flowing through the Atchafalaya River. **The purpose of this report is to identify point sources of nutrient releases within the MRIC and determine the annual quantities released by industry and municipalities. Since industry has been reporting nitrogen and phosphorus compounds in their TRI reports, data should be available to demonstrate any significant reductions made from 1987 to 1998.**

II. Background

Regulatory: In the 1970's, industries nationwide were required by the Clean Water Act to install Best Achievable Control Technology (BACT) to reduce Priority Pollutant releases to the environment. As a result, many facilities, both industrial and municipal, installed biological treatment plants designed primarily to reduce organic components in their wastewaters under the National Pollutant Discharges Elimination System (NPDES). While biological treatment plants reduce organics, they may convert some ammonia to nitrate compounds. They also reduce the discharge of total ammonia by about 20% in the form of bio-solids wasted from the process. Industries that manufactured ammonia or nitric acid were required to monitor these chemicals under their NPDES Permits. Over all, there is a paucity of data on nutrients during the 1970s and 1980s.

Congress passed the Emergency Planning and Community Right-to-Know Act in 1986 that established the Toxics Release Inventory (TRI). The objective was to promote planning for chemical emergencies, and to provide information to the public about the presence and release of toxic and hazardous chemicals in their communities. Following passage of the Pollution Prevention Act of 1990, the TRI was expanded to include mandatory reporting of additional waste management and pollution prevention activities. The list of TRI chemicals has changed frequently with the addition of new chemicals and deletion of other chemicals and chemical categories, thus limiting the historical usefulness except for specific chemicals and categories.

Several questions have been raised concerning the "correctness" of the reported concentrations of various chemicals released to the environment. The problem is related to the "Basis of Estimates" allowed by the Environmental Protection Agency (EPA) and used by industry. Estimates can be based on any one of the following:

Monitoring Data
Mass Balance Calculations
Best Engineering Judgment
Published Emission Factors

This can cause variations in numbers between similar companies in the same industry, as well as, differences from one year to the next depending on which method the individual developing the numbers employed. An effort is made to deal with these differences and it is not anticipated that there will be any significant impact on the nutrient data. Other factors resulting from changes in the reporting of ammonia and nitrates in 1994 and 1995 that will have greater impact are discussed in the following sections.

Mississippi River: The Mississippi River System (MRS), which includes the Atchafalaya River, is the largest drainage basin on the North American Continent. It collects the drainage from approximately 41% of the surface area of the 48 contiguous states. The basin stretches from Pennsylvania to Idaho and from Minnesota to Louisiana. The MRS provides 90% of the freshwater inflows to the Gulf of Mexico. The health of the northern Gulf of Mexico and associated estuaries is therefore directly related to the quality of Mississippi River water.

Hypoxia Zone: Hypoxia and eutrophication are natural processes that occur in freshwater and salt water systems. Microorganisms in these waters and sediments respond to changes in nutrient concentrations, including carbon, nitrogen, phosphorous, and trace elements. Most studies of hypoxic areas have focused on phytoplankton productivity and its role in the eutrophication paradigm. The eutrophication paradigm is simply a sequence of processes that occur as a result of external nutrient loading. The process begins with the stimulation of primary production of algae and other forms of plankton. The organic carbon produced by planktonic production sinks through the water column and fuels aerobic microbial growth, thus depleting the available oxygen. This paradigm is probably only one of the more important elements that are responsible for the formation of hypoxic zones. In some instances, human activities can accelerate eutrophication and hypoxic conditions.

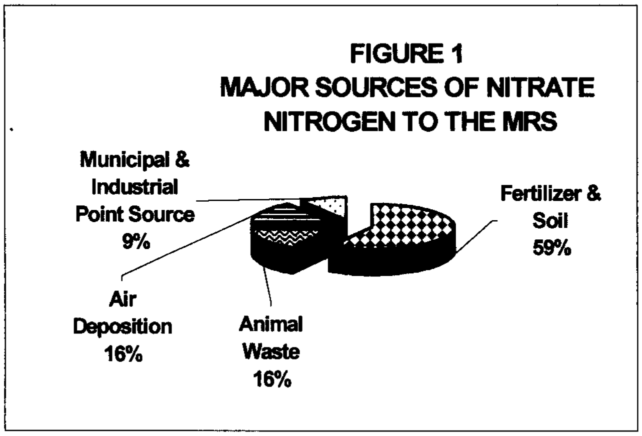
In response to reports of a growing hypoxic zone in the northern Gulf of Mexico, the "Mississippi River/Gulf of Mexico Watershed Nutrient Task Force" was formed in 1997. The Task Force asked the White House Office of Science and Technology Policy to conduct a scientific assessment of the causes and consequences of Gulf hypoxia through its Committee on Environment and Natural Resources (CENR). In 1998, the charge to submit an hypoxia management plan for the Gulf was written into law at the end of the 105th Congress (Section 604a of P.L. 105-383).

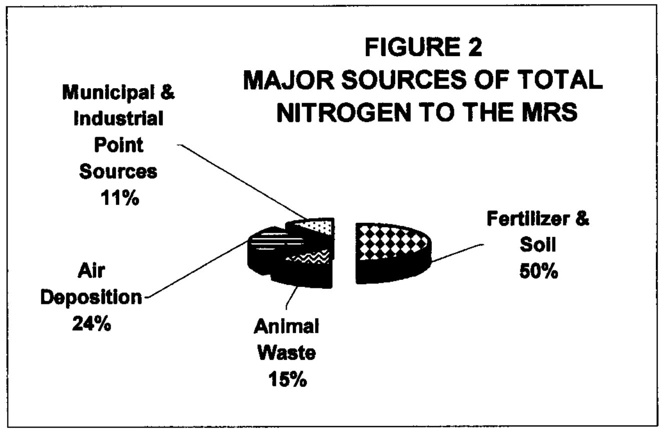
The CENR formed a Hypoxia Work Group that conducted a scientific assessment of the hypoxia problem in the Gulf of Mexico. Six interrelated reports, which examined various aspects of the hypoxia issue, were developed by six teams with experts from within and outside of government. The research teams analyzed existing data and applied existing models of the watershed-gulf system. They also identified additional research or data needed to fill knowledge gaps. Appendix 1 presents a list of the six reports, their topics, and group leader.

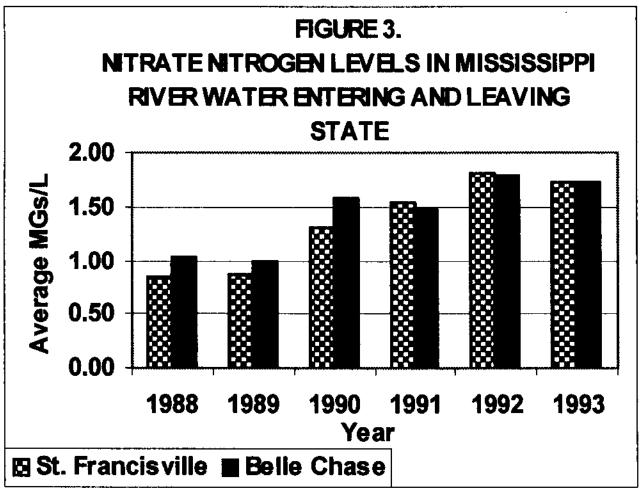
Based on these reports, the major source of nitrogen in the MRS appears to be from upstream non-point sources. Figures 1 and 2 present estimates of the sources of nitrate nitrogen and total nitrogen in the MRS. The contribution from permitted point sources like those within the MRIC is only 9% for nitrate nitrogen and 11% for total nitrogen.

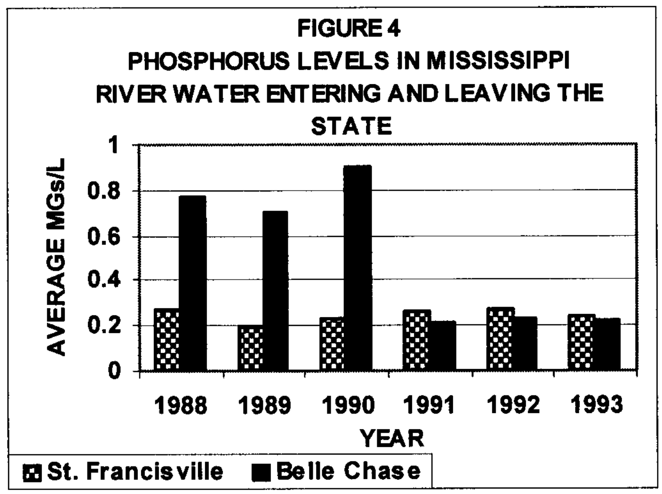
The role of the Mississippi River in the Gulf of Mexico hypoxia problem was also examined by Carey, et al (1999) of the Environmental Institute at The University of Alabama. They estimated that nitrate nitrogen represents 53% of the nitrogen exported to the Louisiana Shelf. Organic nitrogen accounts for 43% with ammonia and other compounds making up the remaining 4%.

It should also be noted that the nutrient levels in the Mississippi River water entering Louisiana are essentially the same when water leaves the state and enters the Gulf of Mexico (Preslan, et .al., 1997). Figures 3 and 4 summarize LDEQ water quality data reported in RiverSentinel 1994 that support this conclusion in spite of excursions in phosphorus levels.









III. Analysis and Discussion of Available Data

Nutrient Releases to the Mississippi River

The quantities of ammonia, nitrates, and phosphoric acid released to the Mississippi River within the MRIC were obtained from Form R, TRI data submitted by facilities to LDEQ. TRI data for phosphoric acid appear to be reliable. The concentrations of ammonia (ammonia compounds) and nitric acid (nitrate compounds) are more difficult to interpret due to changes in TRI reporting requirements. For example, in 1994 the chemical listing for ammonia was modified to include anhydrous ammonia and aqueous ammonia, disassociatable ammonium salts, and other sources; only 10% of the total aqueous ammonia is reportable under this listing. Beginning in 1995 ammonium nitrate and ammonium sulfate were delisted from the TRI; any ionizable nitrate salt released into the water was reported under a new listing "nitrate compounds" at 100% of the nitrate value. Also, some industries that use river water for cooling and in processes may be required to include the incoming nitrogen compounds in their TRI reporting concentrations.

It should be noted that facilities which have installed biological, chemical (Cl_2 and O_3) and physical treatment systems to remove organics and ammonia from process wastewaters, may generate nitrates. Prior to 1995, these compounds were not included in TRI reports or specified in their NPDES permits. Aerobic bio-treatment and chemical systems can convert organic nitrogen and ammonia to nitrate. In 1995, nitrate compounds became reportable under the TRI.

The following sections present the quantities of ammonia, nitrates, and phosphoric and nitric acids released to the river within the MRIC. Voluntary pollution prevention efforts by industry have contributed to significant nutrient reductions at many of these facilities. These efforts are discussed along with regulatory changes that have impacted on nutrient releases.

Ammonia and Nitrate Nitrogen Releases from Point Sources

Ammonia and nitrate nitrogen reportedly are key nutrients in the "hypoxia problem" in the Gulf of Mexico. Based on the numbers in Figures 1 and 2, point sources represent only a small percentage of the nitrate nitrogen and total nitrogen discharged to the MRS. In Louisiana, point sources along the MRIC represent important potential sources of nitrogen, as well as phosphorus releases to the basin. The following sections present available data on the reported quantities of ammonia and nitrates released to the river within the MRIC.

Industrial Point Sources: The number of industrial facilities discharging to the river has varied considerably since the 1970's when the EPA began addressing point source discharges. In addition to the number, the size and types of industrial facilities have also varied during this period. Thus, the available information on the quantities and types of discharges prior to 1987 is limited. Since 1987, industry has reported releases to the river as part of the TRI program. Tables 1 and 2, summarize the available TRI data on ammonia.

Table 1 shows the annual TRI ammonia releases to the river from chemical and fertilizer plants within the MRIC from 1987 to 1998. Table 2 shows the annual TRI ammonia releases from refineries during this same period. In 1994, the EPA changed the reporting of ammonia requiring that industry report only 10% of total aqueous ammonia released. As a result, there appeared to be significant reductions in the quantities of ammonia reported after 1994. To avoid confusion, the data in Tables 1 and 2 were adjusted to 100%after 1994.

The general trend has been a reduction in the quantities of ammonia released to the river by industry. Twelve of the 17 chemical plants and 3 of the 7 refineries reporting between 1987 and 1998 reduced the amount of ammonia released to the river (Tables 1 and 2). Seven chemical plants and one refinery reported infrequent releases of ammonia. Four of the six fertilizer plants reporting during this period reduced ammonia releases to the river. Some of the variation observed in the data were apparently due to EPA TRI guideline changes as noted above. However, some plants may release ammonia to the atmosphere or dispose of it in injection wells, thus reducing the amount released to the river. This probably explains why some facilities had no

TABLE 1.
AMMONIA RELEASES IN THE MRIC TO THE MISSISSIPPI RIVER FROM CHEMICAL AND FERTILIZER PLANTS
(Pounds/Year)*

Company	Location	1987	1988	1989	1990	1991	1992	1993	1994**	1995	1996	1997	1998
CHEMICAL													
Air Products	Orleans	36,000	40,369	32,889	30,826	28,664	16,139	19,757	17,651	-***	-	-	-
Air Products	Iberville	-	-	-	-	-	-	-	-	36,470	27,760	-	-
Borden Chemical	Ascension	108,770	60,635	26,837	126,495	150,426	130,912	100,596	105,680	75,060	32,530	54,390	56,840
BASF	Ascension	-	-	-	-	-	-	-	-	44,000	-	-	88,000
Colonial Sugar	St. James	-	11,522	21,000	-	-	-	-	-	-	-	-	-
Cytec	Jefferson	-	409,100	317,750	260,400	290,750	290,250	350,050	350,050	372,500	580,300	310,000	300,000
Daybrook Fisheries	Plaquemines	-	-	40,000	40,000	-	-	-	-	-	-	-	-
DOW	Iberville	110,000	153,000	190,000	170,000	98,000	250,000	480,000	561,000	615,500	474,000	480,000	640,000
EXXON Chemical	East Baton Rouge	-	59,000	48,000	46,000	130,000	210,000	380,000	99,000	200,000	98,000	93,000	72,000
EXXON Chm. Am	East Baton Rouge	-	-	20,000	29,000	15,000	17,000	20,000	1,500	23,000	-	-	-
Georgia Gulf	Iberville	12,000	12,000	11,000	-	-	-	-	-	-	-	-	-
Georgia Pacific.	East Baton Rouge	-	-	-	-	-	-	-	10,000	60,000	60,000	59,000	-
LaRoche Industries	East Baton Rouge	-	-	-	1,200,000	1,200,000	1,200,000	1,000,000	-	-	-	-	-
Melamine	Ascension	160,000	39,739	-	-	226,621	212,464	258,330	251,000	205,430	218,480	319,650	187,820
Monsanto	St. Charles	47,000	94,000	20,000	49,000	37,000	26,000	32,000	27,000	26,000	34,000	38,000	46,000
NALCO Chem.	St. John	-	-	43,310	56,320	-	-	-	-	-	-	-	-
Novartis	Iberville	-	-	110,000	98,059	127,755	135,325	68,504	32,870	97,860	64,000	105,510	98,490
SUBTOTAL		473,770	879,365	880,786	2,106,100	2,304,216	2,488,090	2,709,237	1,455,751	1,644,290	1,528,780	1,405,160	1,432,310
As Ammonia-N (82.35%)		390,150	724,157	725,327	1,734,373	1,897,522	2,048,942	2,231,057	1,198,811	1,354,073	1,258,950	1,157,149	1,179,507
FERTILIZER****													
AMPRO Fertilizer	Ascension	-	-	-	34,493	34,976	34,245	32,966	31,830	34,750	40,330	-	-
CF Industries	Ascension	440,800	501,250	51,960	46,098	62,943	53,476	55,984	91,735	54,100	55,800	47,500	48,900
IMC Agrico Chem.	St. Charles	51,022	100,000	84,000	59,000	14,000	-	-	-	20,000	15,000	-	14,560
IMC Ag./Faustina	St. James	359,510	387,000	294,000	395,300	-	-	-	10,370	429,620	364,070	388,330	380,370
PCS Nitrogen	Ascension	450,000	292,500	225,000	216,000	220,770	272,475	220,028	186,345	220,110	236,320	360,180	330,190
Triad Nitrogen	Ascension	436,212	563,122	462,417	474,864	373,475	352,211	355,016	249,120	351,510	364,570	445,640	483,430
SUBTOTAL		1,737,544	1,843,872	1,117,377	1,225,755	706,164	712,407	663,994	569,400	1,075,340	1,035,760	1,241,650	1,257,450
As Ammonia-N (82.35%)		1,430,867	1,518,429	920,160	1,009,409	581,526	586,667	546,799	468,901	885,542	852,948	1,022,499	1,035,510
TOTALS		2,224,384	2,723,237	1,998,163	3,331,855	3,010,380	3,200,497	3,373,231	2,025,151	2,719,630	2,564,540	2,646,810	2,689,760
As Ammonia - N (82.35%)		1,831,780	2,242,585	1,645,487	2,743,783	2,479,048	2,635,609	2,777,856	1,667,712	2,239,615	2,111,899	2,179,648	2,215,017

*Data obtained from TRI reports. ** Beginning in 1994-95, only 10% of ammonia released had to be reported. Data are adjusted to 100%. ***(-) Indicates none reported or <10,000 pounds reported. ****Ammonia and/or phosphoric acid producers.

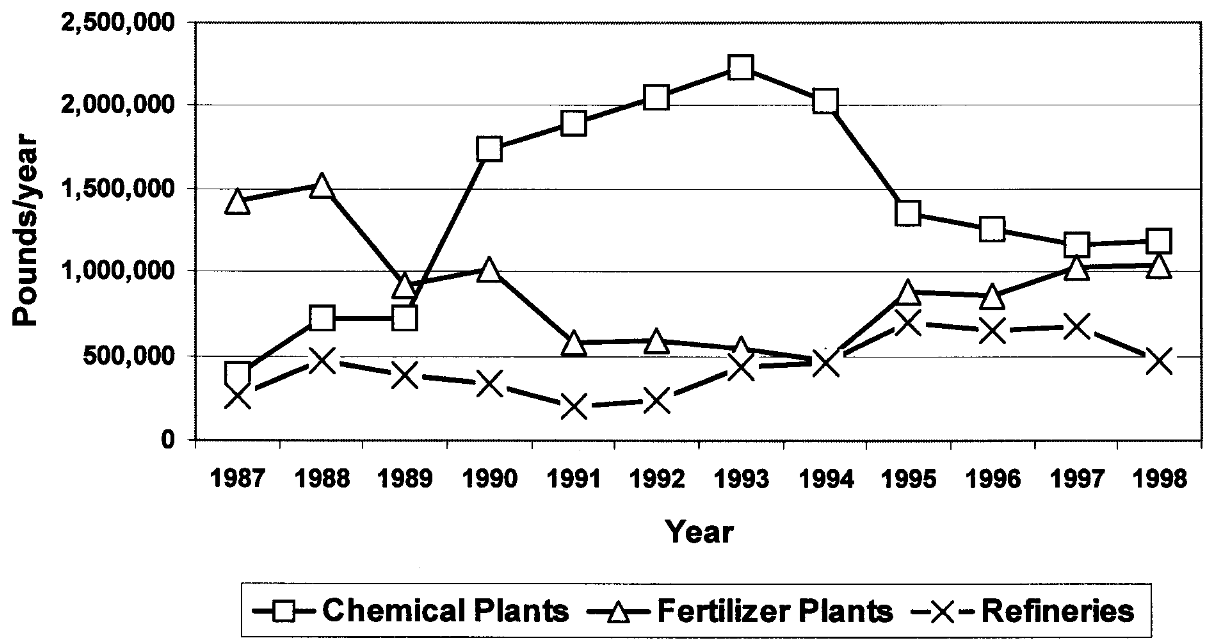
TABLE 2.
AMMONIA RELEASES IN THE MRIC TO THE MISSISSIPPI RIVER FROM REFINERIES
(Pounds/Year)*

Company	Parish	1987	1988	1989	1990	1991	1992	1993	1994**	1995	1996	1997	1998
BP Oil	Plaquemines	208,240	200,000	140,000	160,000	91,000	170,000	250,000	230,000	280,000	330,000	280,000	250,000
Chalmette Ref.	St. Bernard	- ***	-	-	-	-	14,000	16,000	57,000	38,000	53,000	290,000	39,000
EXXON Ref.	East Baton Rouge	-	89,000	46,000	58,000	32,000	-	19,000	20,000	181,900	28,220	12,020	34,030
Marathon Oil	St. John	57,000	44,000	38,000	37,000	21,000	17,000	11,000	13,000	-	75,390	27,480	32,660
Murphy Oil	St. Bernard	-	-	15,000	-	-	-	-	54,540	71,080	95,000	10,000	-
Shell Oil Co.	St. Charles	60,000	236,900	204,000	126,000	83,000	70,000	101,000	124,000	135,600	184,000	179,000	165,000
Star Enterprise	St. James	-	-	33,275	29,952	26,000	25,000	135,000	63,000	145,940	26,000	29,550	46,580
TOTALS		325,240	569,900	476,275	410,952	253,000	296,000	532,000	561,540	852,520	791,610	828,050	567,270
As Ammonia - N (82.35%)		267,835	469,313	392,212	338,419	208,346	243,756	438,102	462,428	702,050	651,891	681,899	467,147

*Data obtained from TRI reports. ** Beginning in 1994-95, only 10% of ammonia released had to be reported. Data are adjusted to 100%. ***(-) Indicates none reported or <10,000 pounds reported.

releases to the river for several years and then suddenly report significant releases. For example, LaRoche Industries released an average of 1.15 million pounds of ammonia between 1990 and 1993. This amounted to 48% of the average ammonia released from the other chemical plants during this period. Figure 5 is a graphic presentation of ammonia releases from the three industry sectors. The impact of the additional 48% of ammonia released by LaRoche Industries between 1990 and 1993 is quite apparent.

**FIGURE 5.
AMMONIA NITROGEN RELEASES FROM INDUSTRIAL POINT SOURCES TO THE MISSISSIPPI RIVER IN THE MRIC**



During the period 1987 to 1994, a number of industries were required to report ammonium nitrate releases as part of the TRI. Table 3 shows the reported releases of ammonium nitrate by CF Industries and PCS Nitrogen during this period. The table also gives a breakdown of releases as ammonia and nitric acid. In 1995, the EPA delisted ammonium nitrate and ammonium sulfate from the reportable TRI chemicals as noted previously. To avoid confusion in reporting the data, the ammonia fraction was added to the ammonia data (Tables 1 and 2), and the nitrate fraction was reported in Tables 4 and Figure 6. Any ionizable nitrate salt released into the water was reported under the TRI as "Nitrate Compounds, CAS #N511" category based on 100% of the nitrate released. These compounds accounted for about 60% (13,371,248 pounds) of all newly listed chemicals in 1995.

TABLE 3
AMMONIUM NITRATE RELEASES IN THE MRIC TO THE MISSISSIPPI RIVER
(Pounds/Year)*

Company	Parish	1987	1988	1989	1990	1991	1992	1993	1994
CF Industries	Ascension	48,000	50,000	49,600	39,547	59,300	50,250	57,440	136,600
PCS Nitrogen	Ascension	2,000,000	1,300,000	1,000,000	960,000	981,200	1,211,000	977,900	828,200
TOTALS		2,048,000	1,350,000	1,049,600	999,547	1,040,500	1,261,250	1,035,340	964,800
Ammonia (22.5 %)		460,800	303,750	236,160	224,898	234,113	283,781	232,952	217,080
As Ammonia-N (82.35 %)		379,469	250,138	194,972	185,204	192,792	233,694	191,836	178,765
Nitric Acid (77.5 %)		1,587,200	1,046,250	813,440	774,649	806,387	977,469	802,388	747,720
As Nitrate-N (22.22%)		352,676	232,477	180,746	172,127	179,179	217,194	178,291	166,143
TOTAL NITROGEN		732,145	482,615	375,718	357,331	371,971	450,888	370,127	344,908

*Data obtained from DMR and TRI reports.

TABLE 4
NITRATE COMPOUNDS RELEASED IN THE MRIC TO THE MISSISSIPPI RIVER
(Pounds/Year)*

Company	Parish	1995	1996	1997	1998
Air Products Chem.	Iberville	147,334	61,573	56,206	55,327
BASF Corporation	Ascension	2,200,000	2,100,000	1,400,000	840,000
CF Industries, Inc	Ascension	541,500	560,900	520,500	496,000
Chalmette Refining	St. Bernard	140,000	200,000	200,000	140,000
EXXON Refinery	East Baton Rouge	1,766,319	2,005,479	4,090,119	3,380,362
EXXON Chemical	East Baton Rouge	970,000	13,000	38,000	14,000
Georgia Pacific Corp.	East Baton Rouge	25,000	24,000	23,600	23,500
Monsanto Company	St. Charles	230,000	160,000	197,000	170,000
Murphy Oil USA	St. Bernard	44,216	68,000	70,000	83,384
Nalco Chemical	St. John	28,000	26,000	29,000	31,000
Novartis Crop Protection	Iberville	431,455	1,188,919	441,676	858,029
PCS Nitrogen	Ascension	538,394	653,461	601,000	581,000
Shell Oil Co.	St. Charles	-**	26,000	-	-
Star Enterprise	St. James	64,000	550,000	207,775	-
The Dow Chemical Co.	Iberville	57,200	57,200	57,200	58,000
TOTALS		7,183,418	7,694,532	7,932,076	6,730,602
TOTAL NITRATE - N (22.6%)		1,623,452	1,738,964	1,792,649	1,521,116
CF IND. & PCS N, NO_3- N***		244,056	274,445	253,457	243,502
Treatment Generated, NO_3 - N****		1,379,396	1,464,519	1,539,192	1,277,614

*Data obtained from DMR and TRI Reports. **(-) Indicates none reported or <10,000 pounds reported. ***CF Industries and PCS Nitrogen releases are process wastes. ****Treatment generated nitrate releases are produced in chemical or biological wastewater treatment systems.

Table 4 presents the quantities of nitrate compounds released from 1995 to 1998. Fifteen facilities reported nitrate releases during this period. It was assumed for the purposes of this report that CF Industries and PCS Nitrogen reported nitrate releases primarily from chemical process wastes. It was also assumed that the nitrate from the other facilities was generated biologically or chemically from ammonia in their wastewater treatment systems.

Eight of the 15 facilities reporting nitrate compounds (Table 4) show reductions over the period 1995 to 1998. Six facilities had increases and 1 remained unchanged. Apparently, the majority of nitrate compounds released from these facilities are in biologically or chemically treated wastewaters discharged to the river. In these cases, the nitrate compounds are generated by the treatment processes. It was also assumed that the quantities of dissociated nitrate reported were actually NO_3 and thus the conversion to nitrate nitrogen was made.

BASF reported significant nitrate compound releases between 1995–1998 that were generated in their ozone and biological treatment systems. They are currently modifying their biological treatment system to include bio-denitrification to convert nitrate to nitrogen. This voluntary pollution prevention effort should greatly reduce the release of nitrates to the river based on their 1998 operations.

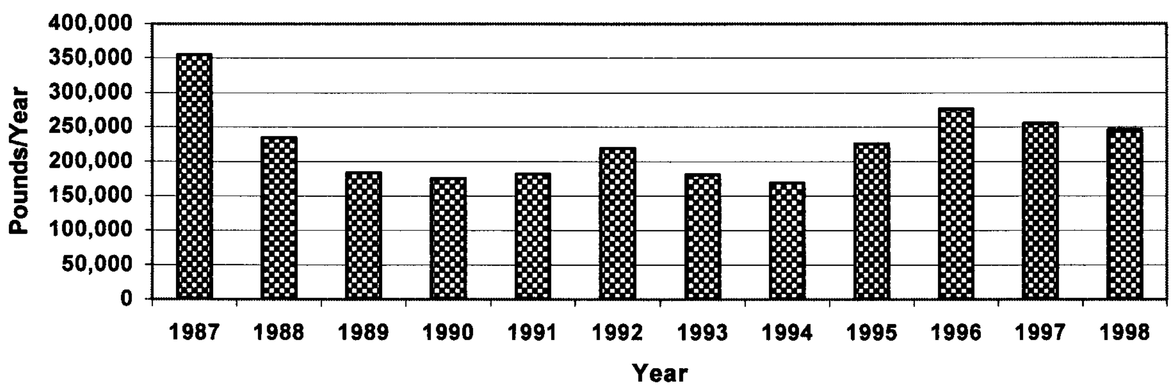
It should be noted, as pointed out earlier, that the chemical and refining industries had already made significant reductions in the quantities of pollutants released in the 1970's as a result of the Clean Water Act (CWA). Cytec and EXXON provide good examples of the impact the CWA had on the discharge of ammonia.

For example, Cytec Industries reported ammonia nitrogen releases to the river prior to the CWA in 1976 of 10,585,000 pounds. In 1977, the year the CWA and BACT became effective, they reported releases of 3,139,000 pounds of ammonia nitrogen, and have continued to reduce releases. In 1998, Cytec reported 300,000 pounds of ammonia (adjusted for 10%) for a total release of 247,050 pounds of ammonia nitrogen. Thus, from 1976 to 1998 Cytec reduced ammonia discharges to the Mississippi River by more than 90%. It should also be noted that during this period, chemical production at the site more than doubled.

In an effort to develop background information on the petroleum refining industry, a search of Louisiana Department of Environmental Quality permit files indicated that in 1973 only 4 refineries discharged to the river. The largest, EXXON Refining, discharged 1,861,500 pounds of ammonia nitrogen based on original permit applications that reportedly reflected actual discharge levels. This is the equivalent of 4 lbs/year/barrel of daily refining capacity. In 1991, EXXON reported 32,000 pounds of ammonia (Table 2) or 24,883 pounds of ammonia nitrogen. This is equivalent to 0.07 lbs/year/barrel of daily refining capacity.

Table 5 summarizes the data presented in Tables 1, 2, 3, and 4 in terms of "nitrogen" released. Figure 6 is a graphic presentation of the nitrate nitrogen released from CF Industries and PCS Nitrogen from 1987 to 1998. The bar graph shows that while the two companies significantly reduced nitrate releases during this period, the quantity released varied from year to year apparently reflecting changes in throughput. These two companies are the major producers of nitric acid in the MRIC. Nitrate was identified by the Hypoxia Work Group as the most "bioavailable" form of nitrogen. Table 5 shows that in 1998, a total of 1,521,116 pounds (243,502 + 1,277,614 pounds) of nitrate nitrogen was released to the river.

FIGURE 6.
NITRATE NITROGEN RELEASES TO THE MISSISSIPPI RIVER FROM CF INDUSTRIES AND PCS NITROGEN IN THE MRIC

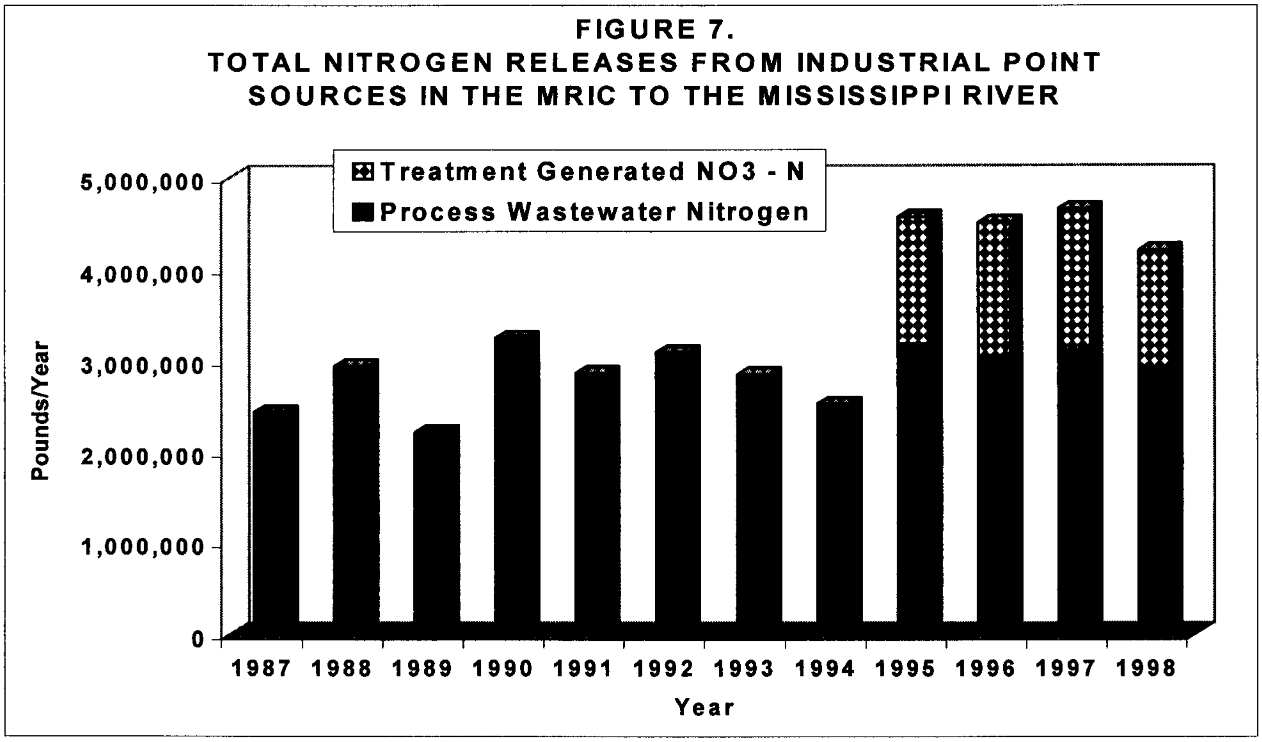


Total annual nitrogen released to the river in the MRIC the last five years (1994-1998) averaged 4,247,161 pounds. As noted above, some of the ammonia entering biological and chemical treatment systems was converted to nitrate compounds which were first reported in the TRI in 1995. Figure 7 is a graphic presentation of the ammonia-nitrogen totals in Table 5 and shows the quantity of previously unreported wastewater treatment generated nitrates from 1995 to 1998.

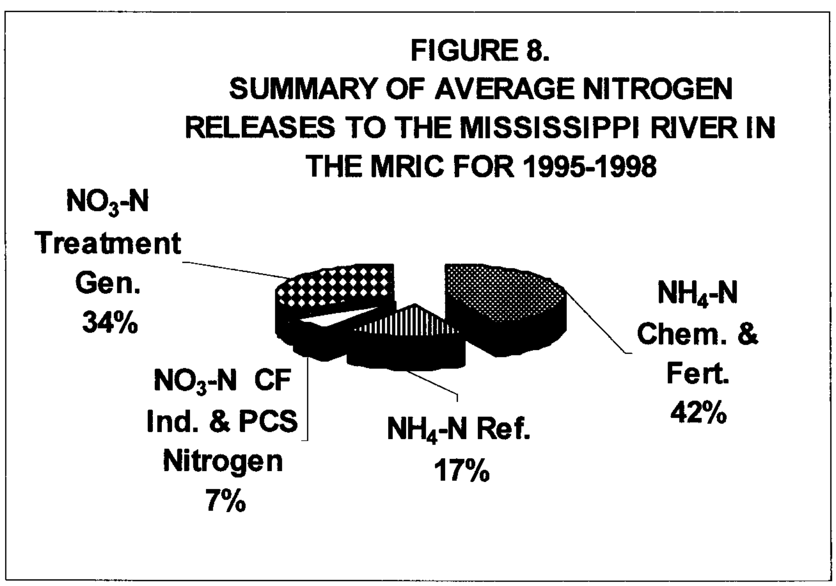
TABLE 5.
SUMMARY OF NITROGEN RELEASES FROM INDUSTRIAL POINT SOURCES IN THE MRIC TO THE MISSISSIPPI RIVER
(Pounds/Year)*

SOURCE	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Tables 1, Chemical Plants - NH_4-N	390,150	724,157	725,327	1,734,373	1,897,522	2,048,522	2,231,057	2,034,221	1,354,073	1,258,950	1,157,149	1,179,507
Tables 1 & 3, Fertilizer Plants - NH_4-N	1,430,867	1,518,429	920,160	1,009,409	581,526	586,667	546,799	468,901	885,542	852,948	1,022,499	1,035,510
Table 2, Refineries - NH_4-N	267,835	469,313	392,212	338,419	208,346	243,756	438,102	462,428	702,050	651,891	681,899	467,147
Total NH_4-N Releases	2,088,852	2,711,899	2,037,699	3,082,201	2,687,394	2,878,945	3,215,958	2,965,550	2,941,665	2,763,789	2,861,547	2,682,164
Tables 3 & 4, CF Ind. & PCS Nitrogen - NO_3-N	352,676	232,477	180,746	172,127	179,179	217,194	178,291	166,143	244,056	274,445	253,457	243,502
Total Process Nitrogen Releases**	2,441,528	2,944,376	2,218,445	3,254,328	2,866,573	3,096,139	3,394,249	3,131,693	3,185,721	3,038,234	3,115,004	2,925,666
Table 4, Treatment Generated - NO_3-N***	-****	-	-	-	-	-	-	-	1,379,396	1,464,519	1,539,192	1,277,614
TOTALS	2,441,528	2,944,376	2,218,445	3,254,328	2,866,573	3,096,139	3,394,249	3,131,693	4,565,117	4,502,754	4,654,196	4,203,280

*Data obtained from DMR and TRI Reports. **Releases primarily from process wastes. ***Releases primarily from wastewater treatment and conversion of ammonia to nitrates.
****(-) Indicates non reported.



Only two facilities in Tables 4 and 5, CF Industries and PCS Nitrogen, actually produce nitrates in their chemical processes. The other facilities apparently convert ammonia to nitrates in their wastewater treatment systems. The total reported nitrogen released from 1995 to 1998 increased due to the EPA required reporting of nitrates generated in wastewater treatment systems. The treatment generated nitrate releases accounted for 34 percent of the total nitrogen released during this period, Figure 8.



During the period 1987 to 1998, there was considerable industrial expansion within the MRIC. Figure 9 presents the annual capital expenditures by the manufacturing sector in the corridor during this period. These data were obtained from the Louisiana Department of Economic Development, and represents the capital expenditures submitted annually by industry for Ad Valorem Tax Credit.

Nitrates were undoubtedly produced prior to 1995 as a result of biological and chemical treatment of ammonia containing wastewaters. While it was not possible to obtain reliable data on the quantities of nitrates generated prior to 1995, using the 1995-98 data (Figure 8) it is possible that an additional 34 % of total nitrogen might have been released annually from industrial wastewater treatment plants between 1987 and 1994.

Figure 10 compares total nitrogen releases in the MRIC, adjusted for the estimated 34% treatment generated nitrate prior to 1995, with capital expenditures from 1987 to 1998. The figure shows that industry controlled releases in spite of major expansion. This was due in part to the voluntary pollution prevention efforts by industry.

FIGURE 9.
CAPITAL INVESTMENT BY THE MANUFACTURING SECTOR IN THE MRIC

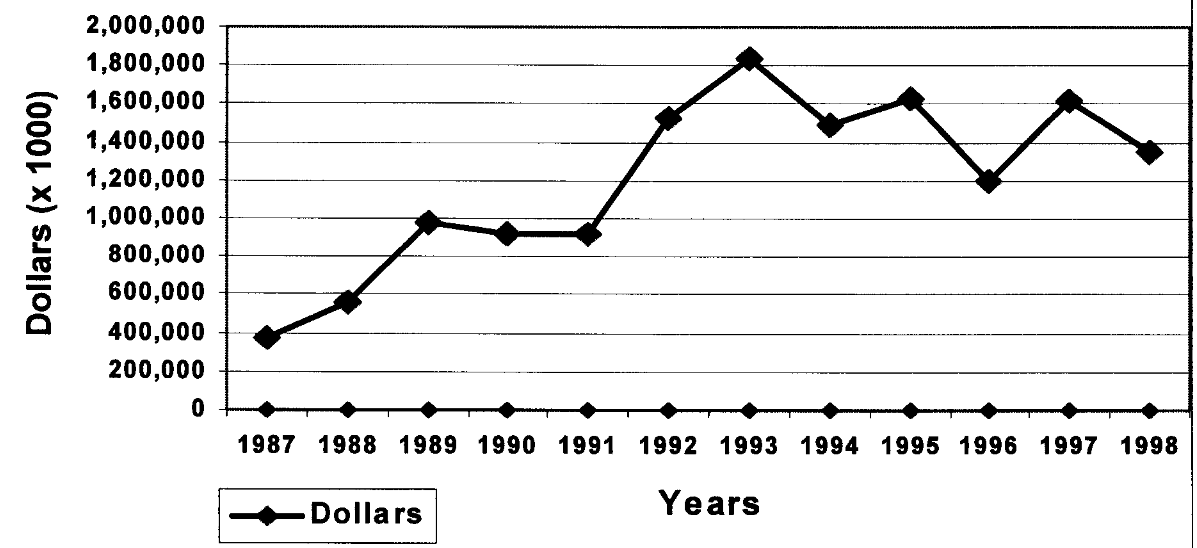
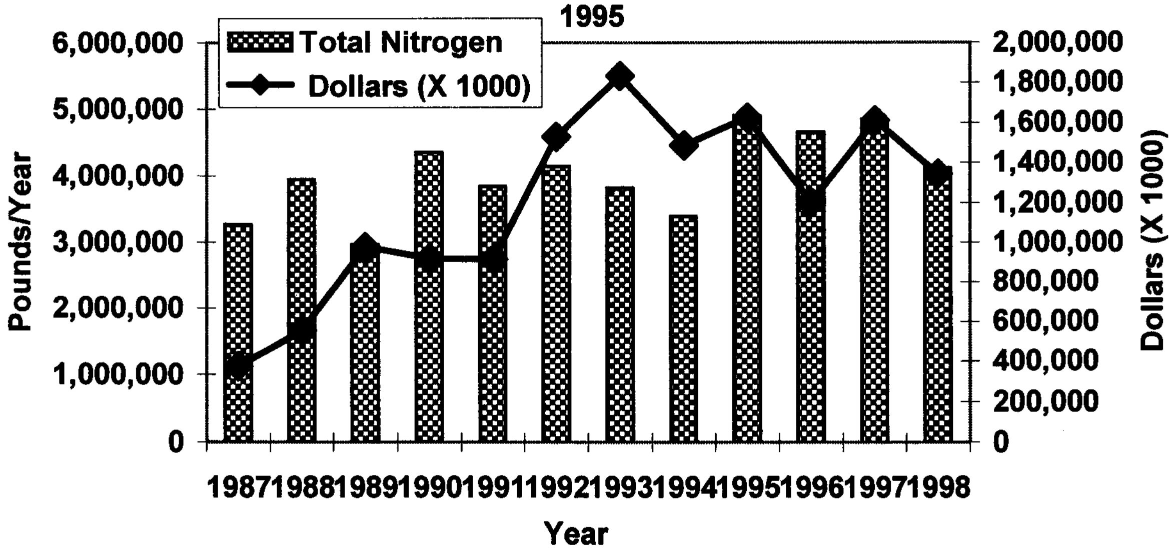


FIGURE 10.
COMPARISON OF CAPITAL EXPENDITURES AND TOTAL NITROGEN RELEASES IN THE MRIC TO THE MISSISSIPPI RIVER ADJUSTED FOR 34% TREATMENT GENERATED NO_3 - N PRIOR TO 1995



The CENR Hypoxia Work Group Report estimated that since 1980 the MRS has discharged an average of 3,528,000,000 pounds of total nitrogen to the Gulf of Mexico each year. Sixty percent of the total, 2,116,800,000 pounds was estimated to be nitrate nitrogen and 2% or 70,560,000 pounds of ammonia nitrogen. Only 9% of the nitrate nitrogen, 190,512,000 pounds, reportedly came from point sources. Eleven percent of the total nitrogen, 388,080,000 pounds, reportedly came from point sources. In 1998 (Table 5), industry released 1,521,116 pounds of nitrate nitrogen to the river, or 0.8% of the estimated 190,512,000 pounds of nitrate nitrogen from point sources entering the Gulf of Mexico annually from the MRS. The 4,203,280 pounds of total nitrogen (ammonia and nitrate) released to the river in the MRIC from industrial point sources in 1998 (Table 5) represents about 1% of the estimated 388,080,000 total nitrogen entering the MRS.

POTW Point Sources: There are nine large Public Owned Treatment Works (POTWs) that discharge to the MRIC and their dry weather flows are as follows:

TABLE 6.
DRY WEATHER FLOWS TO POTWs IN THE MRIC

	Million Gallons/Day
Jefferson Parish	
Elmwood Plant	25
3 West Bank Plants	18
East Baton Rouge	
South Plant	29
Central Plant	20
North Plant	16
New Orleans	
East Plant	120
West Plant	10

These plants are not required under their current NPDES permits to report nutrient levels in their effluent. It was therefore necessary to use typical raw sewage levels to estimate the quantities of ammonia and phosphate in their effluents. The following ammonia and phosphoric acid levels for raw sewage were developed from concentrations of nitrogen and phosphorus in low/medium strength wastes published in Metcalf and Eddy, 1991. They were adjusted based on typical dry weather raw sewage Biochemical Oxygen Demand (BOD) levels reported by the plants, 100 mg/L in Orleans Parish and 150 - 200 mg/L in Jefferson and Baton Rouge Parishes. The lower BOD levels in Orleans Parish are due to the high infiltration/inflow (I/I) in the old collection system. Jefferson and Baton Rouge Parishes also have somewhat lower BOD levels also due to I/I.

TABLE 7.
ESTIMATED NUTRIENT LEVELS IN RAW SEWAGE

Parish	Orleans	Jefferson & E. Baton Rouge
Ammonia, mg/L	15	28
Phosphoric Acid, mg/L	9	14

These concentrations were used to estimate the quantities of ammonia and phosphoric acid in the treated wastewater discharged into the river. It was also assumed that under normal conditions, about 20 percent of these nutrients would be removed by conventional biological treatment processes. The nutrients are removed as wasted biosolids.

Table 8 presents the results of these calculations and indicates that as much as 12.1 million pounds of ammonia (9.45 million pounds of ammonia nitrogen) could be released to the river each year. Depending on the design of the treatment systems used by the POTWs and their loadings, it is possible that they might also release nitrates to the river. Currently, only the Jefferson parish plant has excess capacity under dry weather conditions, and the biological processes may convert a portion of the ammonia to nitrate compounds.

TABLE 8
ESTIMATED NUTRIENT RELEASES TO THE MISSISSIPPI RIVER BY MAJOR POTWs IN THE MRIC*
(Pounds/Year)

Plant	Treated Waste	
Nutrient**	NH_4	H_3PO_4
Jefferson Parish		
Elmwood Plant	1,706,375	848,625
3 West Bank Plants	1,228,590	611,010
E. Baton Rouge		
South Plant	1,979,395	984,405
Central Plant	1,365,100	678,900
North Plant	1,092,080	543,120
Orleans Parish		
East Plant	4,380,000	2,628,000
West Plant	365,000	219,000
TOTAL	12,116,540	6,513,060

*Data are estimates using published levels of ammonia-N and inorganic phosphate-P in raw sewage and dry weather flows. It was assumed that 20% of the nutrients would be removed by the biological treatment.
**Pounds/Year.

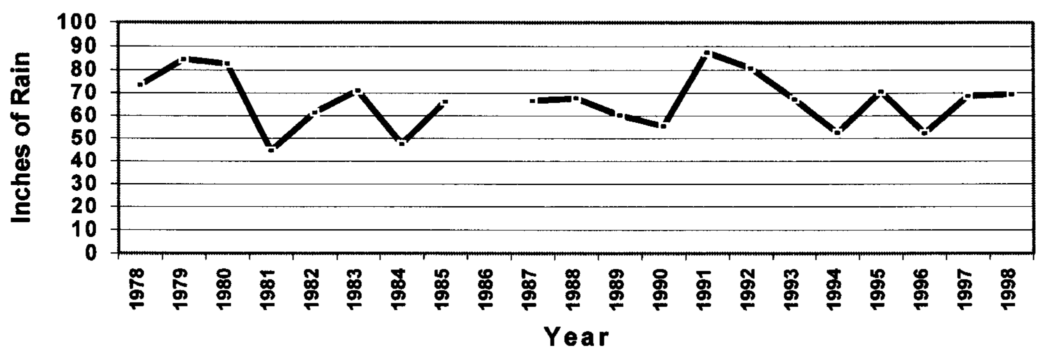
It should be noted that the estimated quantities of ammonia nitrogen released to the river from the POTWs is 3.5 times the 1998 industrial discharge of total nitrogen (Table 5). If you assume that Louisiana's total point source load of total nitrogen to the MRS is the same as the 11% for the total basin, then the ammonia nitrogen releases from the POTWs to the river in the MRIC could represent about 3% of the total. This assumes that the ammonia nitrogen is the only nitrogen source discharged to the river. The combined POTW and industrial point source discharges of nitrogen to the river have essentially no significant impact on river water quality as indicated by the Preslan, et al. 1997 and data in Figures 3 and 4.. The combined 1998 industrial (Table 5) and estimated POTW contribution of nitrogen (Table 8), 16,319,820 pounds, represents only 4.2% of the estimated 388,080,000 of total nitrogen discharged annually to the Gulf of Mexico from point sources in the MRS.

Phosphoric Acid Releases from Point Sources

<u>Industrial Point Sources</u>: The major sources of phosphoric acid releases to the river in the corridor are point sources from fertilizer plants. In 1998, there were four facilities discharging to the river: IMC-Agrico plants at Faustina, Taft, and Uncle Sam; and PCS Nitrogen, Ascension Parish. Table 9 presents the pounds/year of phosphoric acid released from each facility from 1987 to 1998. It should be pointed out that there are differences in processes, types of ore used, and chemicals produced at these plants which influence process efficiency and phosphoric acid recovery.

A major source of phosphoric acid releases in the past has been runoff from phosphogypsum piles, a by-product of phosphoric acid production. The volume of releases from these facilities is influenced greatly by the amount of rainfall in the area in any particular year. There are very few feasible uses for phosphogypsum at the present time, although IMC-Agrico and PCS Nitrogen have on-going research programs to investigate alternatives. Phosphogypsum contains small concentration of nutrients which are retained in the gypsum after filtration from the process.

FIGURE 11.
ANNUAL RAINFALL AT IMC AGRICO's FAUSTINA FACILITY



Rainwater contacting the stacks can become contaminated with these nutrients and ultimately released to the environment. Figure 11 shows the annual rainfall in the Faustina area from 1978 to 1998. The annual rainfall averages around 66.4 inches in this area compared with the U.S. Weather Department average of 59.7 for the New Orleans Airport The high rainfall and occasional major storms in the area greatly influence the phosphoric acid releases from the fertilizer facilities.

TABLE 9.
PHOSPHORIC ACID RELEASES TO THE MISSISSIPPI RIVER FROM MAJOR FERTILIZER PLANTS IN THE MRIC
(Pounds/Year)*

Company	Location	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
PCS Nitrogen	Ascension	40,000,000	23,000,000	15,000,000	7,300,000	13,000,000	22,000,000	12,000,000	10,500,110	14,145,262	20,066,877	29,000,220	19,000,000
IMC-Agrico													
Faustina	St. James	40,819,749	42,944,132	269,302	36,608,700	67,289,860	72,305,000	113,748,205	6,394,559	4,611,981	5,347,967	4,943,067	5,760,379
Taft	St. Charles	657,567	613,000	530,000	613,000	456,000	207,000	217,000	58,000	-**	-	-	-
Uncle Sam	St. James	52,000,000	54,146,000	10,243,000	29,915,000	33,497,000	52,025,674	49,839,912	6,243,738	1,617,831	2,934,547	2,555,826	2,736,301
Subtotal		93,477,316	97,703,132	11,042,302	67,136,700	101,242,860	124,537,674	163,805,117	12,696,297	6,229,812	8,282,514	7,498,893	8,496,680
TOTALS		136,477,316	120,703,132	26,042,302	74,436,700	114,242,860	146,537,674	175,805,117	23,196,407	20,375,074	28,349,391	36,499,113	27,496,680

*Data obtained from companies DMR and TRI Reports. **(-) Indicates none reported or <10,000 pounds reported.

PCS Nitrogen produces food and agricultural grades of phosphoric acid. Because of the product mix and the types of ores used at this facility and limitations on water consumption, they have been unable to achieve major reductions in phosphoric acid releases. However, progress has been made through voluntary pollution prevention initiatives, including continued capping of phosphogypsum stacks, segregation of clean stormwater from water from inactive stacks and process waters, thus reducing the quantity of wastewater generated. Contaminated stormwater and water from inactive stacks are collected in evaporation ponds. Leachate from the gypsum stacks has the highest concentration of phosphoric acid and is recycled. The company continues to implement various pollution prevention programs capping phosphogypsum stacks, and maximizing water reuse to reduce phosphoric acid releases to the environment. Due to the high rainfall and occasional major storms in the area, it is difficult to effectively reduce the volume of discharges to the river. In spite of these problems, PCS Nitrogen has been able to reduce the quantity of phosphoric acid released to the to the river from 40 million pounds in 1987 to 19 million pounds in 1998.

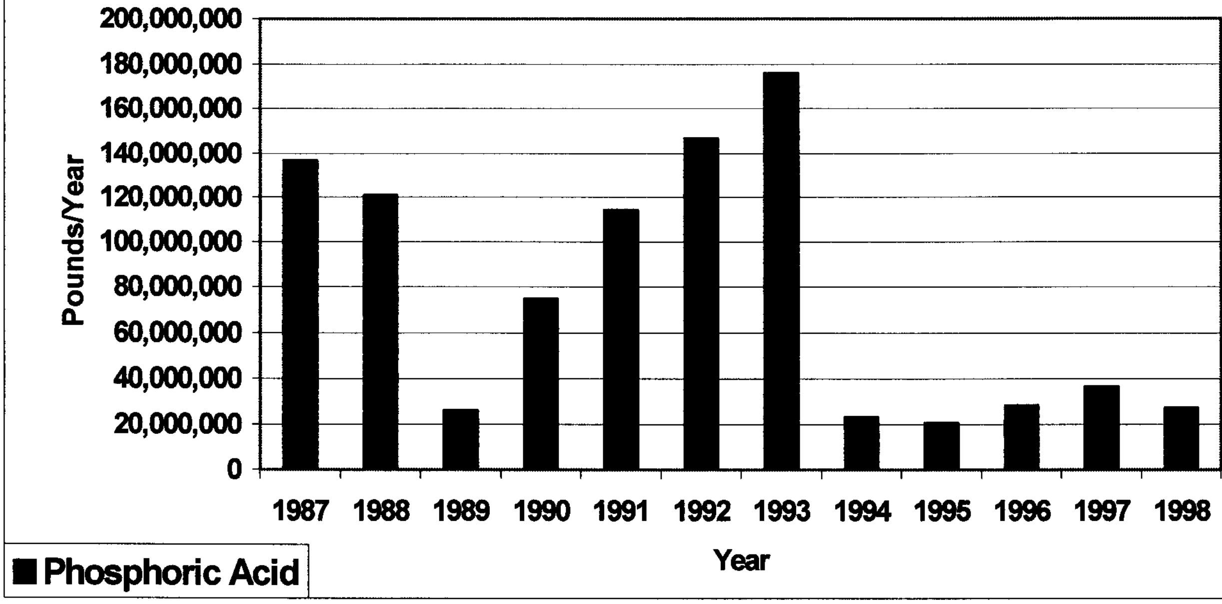
The IMC-Agrico facilities at Faustina, Uncle Sam and Taft produce primarily an agricultural grade phosphoric acid and urea, and are able to reuse substantial quantities of water in their processes and recover the acid. All facilities have implemented voluntary pollution prevention options to increase the recovery of phosphoric acid and minimize releases. IMC-Agrico stores phosphogypsum in large stacks at their Uncle Sam Plant and Faustina Plant. In December 1991, the company made a commitment to the LDEQ to reduce TRI releases to the river by 75 percent from 1988 levels by 1994.

Phosphoric acid discharges from the IMC-Agrico's Louisiana facilities were largely related to contaminated rainfall runoff from inactive phosphogypsum stacks. The inactive stacks at Faustina and Uncle Sam were overlain with eight inches of grass covered clay. Evaporation ponds atop the inactive stacks were constructed with synthetic liners to prevent water from entering the stacks and recharging the stack water system. An under-drain network was installed to collect water from within the stacks for recycle into the production process. The $27,000,000 project was completed in 1993 and the phosphoric acid discharges dropped to 12.7 million pounds in 1994 from 93.5 million in 1987 (Table 9). In 1998, the IMC-Agrico discharged a total of 8.5 million pounds to the river, a reduction of 91%.

The covering of the inactive phosphogypsum stacks and other voluntary pollution prevention efforts involving segregation of clean and contaminated waters, use of evaporation ponds, and water reuse to further recover phosphoric acid are responsible for the continued reduction in releases to the river by PCS Nitrogen and IMC-Agrico.

The fertilizer industry has reduced phosphoric acid releases to the MRIC from a total of 136.5 million pounds in 1987, to a total of 27.5 million pounds in 1998 (Table 9), a reduction of 80%. The data are summarized in Figure 12 which clearly shows the magnitude of these voluntary reductions.

FIGURE 12.
PHOSPHORIC ACID RELEASES TO THE MISSISSIPPI RIVER FROM MAJOR FERTILIZER PLANTS IN THE MRIC



__Fertilizer Industry's Voluntary Pollution Prevention Outreach Efforts:__ The fertilizer industry for a number of years has recognized the need to implement programs to train dealers, extension service personnel, and users to optimize fertilizer utilization and minimize runoff. The industry is well aware of the impact nutrients have on our lakes and rivers, and particularly on the Mississippi River which drains major agricultural areas of the country. Optimization can be achieved by improving timing of fertilizer applications and rates of applications based on the individual crop. They promote "Balanced Nutrition" as the key to optimization. In addition, they promote the environmental aspects of fertilizer use through soil sampling and testing to optimize fertilizer use, and improved tillage practices to control runoff. Brochures are distributed by the companies as well as industry associations like the Fertilizer Institute and the Pot Ash Institute. They support and promote state and federal agricultural programs that provide assistance to the farmers.

Recently, the EPA proposed a rule which would remove phosphoric acid from the TRI based on the fact that phosphoric acid is not toxic and does not meet criteria necessary for a chemical to be listed in the TRI. For perspective, phosphoric acid is an ingredient in cola soft drinks and many animal feeds in addition to being an ingredient in fertilizers. The public comment period for the proposed rule has now concluded and there were no comments offering data to indicate that phosphoric acid is indeed toxic. Therefore, it is anticipated that the EPA will remove phosphoric acid from the TRI in the near future.

Louisiana phosphate producers have agreed that removal of phosphoric acid from the TRI will not cause a "backslide" from their current pollution control and reduction practices. Although the previously discussed improvements were initiated voluntarily, the Louisiana phosphate producers have also agreed to have those improvements incorporated into current and future water and solid waste permits. The improvements have therefore become on-going regulatory requirements. Further, phosphoric acid is a primary product of the Louisiana phosphate producers. It only makes economic sense that the producers continue current reduction/recycling practices, and continue to search for additional recovery and discharge-reduction opportunities.

POTW Point Sources

The phosphoric acid levels in Table 6 were used to estimate the quantities of phosphoric acid in the treated wastewater discharged from the POTWs into the river. It was assumed that under normal conditions, about 20 percent of the nutrient would be removed by the Activated Sludge biological processes. The nutrients are removed as wasted biosolids.

Table 8 presents the results of these calculations and indicates that as much 6.5 million pounds of phosphoric acid (2.06 million pounds of phosphorus) could be released to the river each year from these plants. This is only a fourth of what industry discharged in 1998.

IV. Summary and Conclusions

The White House Office of Science and Technology through its Committee on Environmental and Natural Resources (CENR) formed an "Hypoxia Work Group" to conduct a scientific assessment of the hypoxia (Dead Zone) problem in the Gulf of Mexico. The group concluded that nutrients, primarily nitrates, in Mississippi River water entering the Gulf were an important contributing factor to the development of the hypoxic area. They estimated that 58% of the nitrate came from non-point source fertilizer and mineralized soil. Thirty two percent was equally divided between non-point source animal manure and atmospheric deposition and unmeasured inputs. Only 9% of the nitrate and 11 % of the total nitrogen reportedly came from municipal and industrial point sources.

One objective of this report was to determine the contribution from municipal and industrial point sources of nitrates, ammonia and phosphates in the highly developed industrial corridor between Baton Rouge and New Orleans. A second objective was to demonstrate industry's voluntary efforts to control the discharge of nutrients to the Mississippi River. The major source of information on industrial releases was the Toxic Release Inventory reports prepared by the Louisiana Department of Environmental Quality.

The following conclusions were drawn from the information in these and other available sources of relevant information:

- **TRI reports, while designed for toxic chemicals, required industry to report ammonia, ammonium nitrate, nitrate compounds and phosphoric acid. The EPA changed**

reporting requirements over the years and not all categories were reported every year. It was therefore necessary to make certain assumptions and adjust the data accordingly.

- **Ammonia was the only category that was reported each year beginning in 1987. Based on the TRI data, ammonia releases varied from year to year but, in general, many companies voluntarily reduced the quantities released to the river in the MRIC between 1987 and 1998.**

- **EXXON, the largest refinery in the MRIC in 1973 released the equivalent of 4 lbs. of ammonia/year/barrel of daily refining capacity. In 1991, the refinery released the equivalent of 0.07 lbs. of ammonia/year/barrel of daily refining capacity as a result of the Clean Water Act and Best Available Control Technology requirements.**

- **Nitrate in process wastewater released to the river within the MRIC was reported annually by CF Industries and PCS nitrogen. Significant reductions were achieved between 1987 and 1998 as a result of voluntary pollution prevention actions, and in spite of major changes in through put.**

- **Nitrates generated by the oxidation of ammonia in wastewater treatment systems accounted for 34% of the total nitrogen released to the river in the MRIC from 1995 to 1998.**

- **BASF, a major discharger of treatment generated nitrates, has implemented a voluntary pollution prevent effort to install bio-denitrification to miminize the release of nitrates to the river.**

- **The nitrate nitrogen released from MRIC industrial point sources in 1998 represented only 0.8% of the estimated annual pounds of nitrate nitrogen from point sources entering the Gulf of Mexico from the Mississippi river.**

- **The total nitrogen (ammonia and nitrate) released from MRIC industrial point sources in 1998 represented only 1% of the total nitrogen entering the Gulf of Mexico from the Mississippi River.**

- **Industry voluntarily controlled the release of total nitrogen to the river from 1987 to 1998 in spite of major capital expansion projects during this period.**

- **It was estimated that POTWs discharging into the Mississippi River in the Industrial Corridor discharged 3.5 times as much ammonia nitrogen as industry.**

- **The total industrial and municipal discharges of total nitrogen in the MRIC represented only 4.2% of the total nitrogen from point sources annually entering the Gulf of Mexico from the Mississippi River.**

- **Nutrient releases from industrial and municipal point sources to the Mississippi River in the Industrial Corridor have essentially no impact on nutrients in the river as indicated by water quality testing as the river enters and leaves the State.**

- **The Fertilizer Industry has reduced the quantity of phosphate released to the Mississippi River in the MRIC by 80% as a result of voluntary pollution prevention actions.**

- **The Fertilizer Industry has agreed to have the voluntary improvements incorporated into current and future water and solid waste permits should phosphoric acid be delisted from the TRI.**
- **Voluntary Pollution Prevention Outreach efforts by the Fertilizer Industry train dealers, extension service personnel, and users on how to optimize fertilizer utilization and minimize runoff. They promote "Balanced Nutrition" as the key to optimization.**
- **The voluntary efforts of industry have minimized the impact of nutrient releases from point sources to the Mississippi River in the Industrial Corridor in spite of significant industrial growth between 1987 and 1998. Industry in the corridor is committed to continue their voluntary pollution prevention efforts to control nutrient releases.**

V. Reference Material

Carey, Anne E. et al. 1999, The Role of the Mississippi River in Gulf of Mexico Hypoxia. Final Technical Report. Environmental Institute Publication Number 70. Prepared for the Fertilizer Institute by The University of Alabama, Tuscaloosa, Ala. 35487-0207, 79 pp.

Malek-Wiley, Darryl E., Editor. 1997, "Clean Enough" A Conference on Mississippi River Water Quality, Sponsored by the Lake Pontchartrain Basin Foundation (Papers and Abstracts), 124 pp.

Metcalf & Eddy, Inc. 1991, Wastewater Engineering – Treatment, disposal, and reuse, Third Edition, McGraw-Hill, Inc., page 109.

Preslan, Janet E., et al. 1997, A database on water quality of the Mississippi River. Environmental Progress, pages 145-163, Volume 16, No. 3.

RiverSentinel 1994, Environmental, Health and Social Trends in the Lower Mississippi River Corridor, Institute for Environmental Issues and Policy Assessment, Center for Energy and Environmental Studies, Southern University, Baton Rouge, LA.

Sabins, Dugan S. 1999, Louisiana's water quality strategy for the Mississippi River, "Clean Enough" A Conference on Mississippi River Water Quality, Sponsored by the Lake Pontchartrain Basin Foundation (Papers and Abstracts), pages 1-15.

CENR. 2000. "Integrated assessment of Hypoxia in the northern Gulf of Mexico" National Science and Technology Council, Committee on Environment and Natural Resources, Washington, DC. 58 pp.

NOAA 1999. Science for Solutions Decision Analysis Theories Numbers 15, 16, 17, 18, 19, and 20. U. S. Department of Commerce, National Ocean Service, Coastal Ocean Programs.

U.S. Geological Survey, 1999, The quality of our nation's waters – Nutrients and Pesticides: U.S. Geological Survey Circular 1225.

APPENDIX

CENR HYPOXIA WORK GROUP REPORTS

Report 15 (1). Characterization of Hypoxia.
Lead: Nancy Rabalais, Louisiana Universities Marine Consortium

This report describes the seasonal, interannual, and long-term variation of hypoxia in the Northern Gulf of Mexico, and its relationship to nutrient loadings. It also documents the relative roles of natural and human-induced factors in determining the size and duration of the hypoxia zone.

Report 16 (2). Ecological and Economic Consequences of Hypoxia
Co-Leads: Robert Diaz, Virginia Institute of Marine Science and Andrew Solow, Woods Hole Oceanographic Institution, Center for Marine Policy.

This report presents an evaluation of the ecological and economic consequences of nutrient loading, including impacts of Gulf of Mexico fisheries and the regional and national economy.

Report 17 (3). Flux and Sources of Nutrients in the Mississippi-Atchafalaya River Basin
Lead: Donald Goolsby, U.S. Geological Survey

This report identifies the sources of nutrients within the basin system and within the Gulf of Mexico with two distinct components. The first identifies where, within the basin, the most significant nutrient additions to the surface water system occur. The second estimates the relative importance of specific human activities in contributing to these loads.

Report 18 (4). Effects of Reducing Nutrient Loads to Surface Waters within the Mississippi River Basin and Gulf of Mexico.
Co-Leads: Patrick Brezonik, University of Minnesota and Victor Bierman, Limno-Tech

This report estimates the effects of nutrient source reductions in the basin on water quality in these waters and on primary productivity and hypoxia in the Gulf of Mexico. Modeling analyses were conducted to aid in identifying magnitudes of load reductions needed to effect a significant change in the extent and severity of the hypoxia.

Report 19 (5). Reducing Nutrient Loads, Especially Nitrate-Nitrogen, to Surface Water, Groundwater, and the Gulf of Mexico.
Lead: William Mitsch, Ohio State University

The focus of this report was to identify and evaluate methods to reduce nutrient loads to surface water, groundwater, and the Gulf. The analysis was not restricted to reduction of sources alone, but included means to reduce loads by allowing the system to better accommodate those sources through, for example, modified hydraulic transport and internal cycling routes.

Report 20 (6). Evaluation of Economic Costs and Benefits of Methods for Reducing Nutrient Loads to the Gulf of Mexico.
Lead: Otto Doering, Purdue University.

In addition to evaluating the social and economic costs and benefits of the methods identified in Report 5 for reducing nutrient loads, this analysis includes an assessment of various incentive programs and any anticipated fiscal benefits generated for those attempting to reduce sources.

NOAA 1999. Science for Solutions Decision Analysis Theories, Numbers 15, 16, 17, 18, 19, and 20. U.S. Department of Commerce, National Ocean Service, Coastal Ocean Programs.